REPRODUCING APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

5   The present invention relates to a reproducing
apparatus, particularly relates to the apparatus
which reproduces an information signal recorded on a
recording medium.

Description of the Related Art

10   In recent years, greater density and larger
capacity in a disk-shaped recording medium are
rapidly proceeding. A recording and reproducing
apparatus in which not only a sound signal but also a
still image signal or moving image (video) signal can
15 be finely recorded for long time on the disk-shaped
recording medium and a recording signal can be
reproduced from the disk-shaped recording medium has
been proposed.

In such recording and reproducing apparatuses,
20 since a size of the disk-shaped recording medium
itself is being miniaturized, compared with the
conventional recording and reproducing apparatus
using a tape-shaped recording medium, further
miniaturization has been achieved, rapid and random
25 data-access advantage has been realized, and
remarkable improvement in functions with respect to
easy portability of the disk-shaped recording medium,

high reliability, low cost, search readiness in operation, and the like has been accomplished.

Reproducing operation of the recording and reproducing apparatus using the conventional disk-
5   shaped recording medium will be described below referring to Fig. 15. In Fig. 15, a reproduction trigger unit 1101 outputs a reproduction start instruction in response to user's operation. Then, in a mechanical servo control unit 1102, access
10   processing such as seek to a target address on the disk-shaped recording medium is performed by servo mechanism control on the basis of the reproduction instruction. In advance to the reproduction, a reproduction parameter setting unit 1103 optimizes
15   such a reproduction parameter such as reproducing laser power on the like. A data detection unit 1104 performs such processing as predetermined gain control, waveform equalization, digitalization, and clock extraction on the reproduced data. A
20   demodulation ECC unit 1105 performs error correction on the reproduced data after performing predetermined demodulating processing.

After the error correction processing, the reproduced data is sequentially written into a memory
25   1106. The data is read out from the memory 1106 at a rate slower than writing rate and transmitted to a decoder 1107 of the next stage.

Access operation to the memory 1106 will be described below referring to Fig. 16. Fig. 16 shows time-progression of the amount of data in the memory 1106 and write and readout timing signals. After the reproduction trigger unit 1101 outputs the reproduction instruction at a time t0, the data is written in the memory 1106 between a time t1 and a time t2. The data readout from the memory 1106 is started at the time t2 when the data is accumulated up to a predetermined memory amount "a", and the data readout is continued until a time t3 when the data reaches to a predetermined memory amount "b". Then, the processing, in which the data is written between the time t3 and a time t4 and the data is read out between the time t4 and a time t5, is repeated.

The decoder 1107 expands and decodes compression encoded data which is read out from the memory 1106. A video output processing unit 1108 converts the decoded data into a video signal pursuant to a predetermined output format and outputs the video signal to a display system or an external signal terminal.

As described above, the reproducing processing sequentially proceeds after receiving the reproduction start instruction in the reproducing operation of the conventional recording and reproducing apparatus using the disk-shaped recording

medium. However, it considerably takes time to
output actually the desired video image. Physical
access time to the disk-shaped recording medium by
using the mechanical servo control, and buffering

5   time in which an intermittent and high-speed read
signal obtained from the disk-shaped recording medium
is temporarily stored and decoded at a predetermined
transmission rate, are main factors of such the
waiting time.

10   Some proposals for decreasing the waiting time
in the reproducing operation have been made. For
example, in Japanese Patent Application Laid-Open No.
H08-194982, there has been made the proposal which
decreases the physical access waiting time in such a

15   manner that individual memory spaces are previously
secured for a plurality of the information data
recorded on the disk-shaped recording medium
respectively, the reproduced data having a certain
quantity from a front end is accumulated in the

20   memory space, and the selected information data is
read out from the memory in response to the
reproduction start instruction.

In Japanese Patent Application Laid-Open No.
H11-296862, there has been made the proposal which

25   decreases the buffering waiting time by monitoring an
amount of write data into the memory and outputting
the data from the memory at a time when the minimum

data required for the reproduction is secured.

However, even if configurations described in Japanese Patent Application Laid-Open No. H08-194982 and the like are applied to the conventional

5 recording and reproducing apparatus, there are the following problems in the conventional recording and reproducing apparatus.

At first, when the data recorded on the disk-shaped recording medium is the long-time moving image

10 data, unlike music data, a specific start position such as "the front end of a piece of music" can not be previously designated. Further, as the larger capacity of the disk-shaped recording medium proceeds, the conventional recording and reproducing apparatus

15 could not deal with a situation in which the enormous amounts of data to be previously secured in the memory have swelled.

When writing the data in the memory and reading the data from the memory are dynamically controlled

20 as taught by Japanese Patent Application Laid-Open No. H11-296862, it can not be avoided that quality in buffering function with which the apparatus should be primarily provided is degraded. That is to say, for disturbance such as shock and vibration which are

25 unavoidable for the use of the apparatus in mobile environment, shock-proof function maintaining the continuousness of the data is forced to be traded off

for decreased waiting time. Particularly, even if
the speed-up is attained only by focusing on readout
timing, the problems such as speed-up of the physical
access to the disk-shaped recording medium and other

5   functions still remain.

SUMMARY OF THE INVENTION

In view of the foregoing, it is an object of
the invention to solve these problems.

10   It is another object of the invention to
reproduce rapidly and correctly desired data recorded
on the recording medium by using a memory having
small capacity.

In order to achieve the above-mentioned objects,

15   according to an aspect of the present invention, a
reproducing apparatus of the present invention
comprises reproducing means for reproducing image
data of a plurality of contents from a recording
medium and writing the reproduced image data in a

20   memory, displaying means for displaying a plurality
of representative images of the plurality of contents
on the same screen, selecting means for selecting a
desired representative image from among the plurality
of representative images displayed on the same screen,

25   reproduction instruction means for instructing
reproduction start of the contents corresponding to
the selected representative image, reproduction

processing means for reading out the image data
stored in the memory and outputting the image data as
reproduced image data, and controlling means for
controlling the reproducing means in response to

5   selecting operation by the selecting means so that
the reproducing means reproduces a part of the image
data of the contents concerning the selected
representative image and writes the part of the image
data in the memory, the controlling means controlling

10   the reproduction processing means in response to the
reproduction start instruction by the reproduction
instruction means so that the reproduction processing
means starts readout of the part of the image data
from the memory.

15   The above and other objects and features of the
invention will be apparent from the following
detailed description of aspects of the invention
referring to the accompanying drawings.

20   BRIEF DESCRIPTION OF THE DRAWINGS
           Fig. 1 is a functional block diagram showing
overall function of an image pickup recording and
reproducing apparatus;
           Fig. 2 is a block diagram showing a

25   configuration of a disk drive apparatus;
           Fig. 3 is a functional block diagram showing a
prereproduction processing function;

Fig. 4 is a timing chart showing prereproduction processing in a first embodiment;

Fig. 5 is a flow chart showing the prereproduction processing in the first embodiment;

5   Fig. 6 shows an example of a GUI screen for setting initial values of a reproduction menu;

Fig. 7 shows an example of a hierarchy of the reproduction menu;

Fig. 8 shows an example of the hierarchy of the

10   reproduction menu;

Fig. 9 is a view for explaining a method of selecting a reproduction start point;

Fig. 10 is a flow chart showing the prereproduction processing in a second embodiment;

15   Fig. 11 is a view for explaining the reproduction start point in the second embodiment;

Fig. 12 is a timing chart showing the prereproduction processing in the second embodiment;

Fig. 13 is a flow chart showing the

20   prereproduction processing in a third embodiment;

Fig. 14 is an explanatory view of computer function to which the invention can be applied;

Fig. 15 is an explanatory view of a conventional disk reproduction processing; and

25   Fig. 16 is an explanatory view of memory access operation in the conventional reproduction.

DESCRIPTION OF THE PREFERED EMBODIMENTS

Preferred embodiments of the invention will be described below referring to the accompanying drawings.

5 First Embodiment

The invention is applicable to, for example, an image pickup recording and reproducing apparatus (combination video camera and videocassette recorder system, so-called camcoder) 200.

10 The overall configuration and a series of operations of the image pickup recording and reproducing apparatus 200

The image pickup recording and reproducing apparatus 200 can pick up, record, and reproduce a moving image. As shown in Fig. 1, the image pickup recording and reproducing apparatus 200 includes an optical control system lens group 201 having an optical control system such as focusing and zooming, a diaphragm 202, a camera signal processing unit 203, a compression and expansion processing unit 204, a recording and reproducing processing unit 205, a recording medium (e.g., a disk) 206, a medium control unit 207, a graphical user interface (hereinafter referred to as GUI unit) 100, a memory control unit 106, a system control unit 107, a memory 108, and a video output processing unit 109.

The diaphragm 202, the camera signal processing

unit 203, the compression and expansion processing unit 204, the recording and reproducing processing unit 205, the medium control unit 207, the GUI unit 100, the memory control unit 106, the system control

5   unit 107, the memory 108, and the video output processing unit 109 are connected to one another through a data bus 208 so as to be able to communicate with one another.

In the image pickup recording and reproducing

10   apparatus 200, the memory 108 is memory space which is used by each functional block uses in a time-shared manner through the data bus 208, and the memory 108 is controlled and managed by the memory control unit 106.

15   The memory 108 is also used as a buffer memory (shock-proof memory) for performing prereproduction processing described hereinafter.

The system control unit 107 controls the whole of image pickup recording and reproducing apparatus

20   200 by executing a predetermined program and the like.

The GUI unit 100 is an interface between a user and the image pickup recording and reproducing apparatus 200. The GUI unit 100 directs the system control unit 107 to perform the operation in response

25   to user's key operation and the like. For example, when the GUI unit 100 instructs the system control unit 107 to perform image pickup operation and

recording operation, light from an object (not shown) is converted into an optical signal, in which predetermined brightness, angle of view, focus, and the like are controlled by the optical system lens

5   group 201 and the diaphragm 202, to be input to the camera signal processing unit 203.

The camera signal processing unit 203 converts the input optical signal into an electric signal with CCD, converts the electric signal into a continuous

10 image signal by performing sampling and charge hold, and performs signal processing such as color separation, gradation correction, and white balance adjustment on the image signal. Then, the camera signal processing unit 203 outputs the post-signal

15 processing image signal in the form of image pickup data and writes the image pickup data in the memory 108 through the data bus 208.

The compression and expansion processing unit 204 compression-codes the image data, which is output

20 from the camera signal processing unit 203 and written in the memory 108, by using a predetermined compression encoded method and writes the compression-coded image data in a predetermined area of the memory 108 again.

25   The recording and reproducing processing unit 205 performs error-correcting coding, modulation processing, and the like on the image data, which is

compression-coded and written in the memory 108 by the compression and expansion processing unit 204, converts the image data into the form suitable for recording the image data on the disk 206, and records

5   the image data in the disk 206 through the medium control unit 207.

When the GUI unit 100 instructs the system control unit 107 to perform reproducing operation, the recording and reproducing processing unit 205

10   demodulates the data read out from the disk 206 to detect the original digital data, performs error-correcting processing on the digital data, and writes the digital data in the memory 108 through the data bus 208.

15   The compression and expansion processing unit 204 reads out the image data, which is reproduced by the recording and reproducing processing unit 205, from the memory 108, decodes the image data to expand information quantity of the image data, and then

20   writes the image data in the memory 108 again.

The video output processing unit 109 not only displays the image pickup data or the reproduced image data, which is written in the memory 108 from the camera signal processing unit 203, operating

25   status of the image pickup recording and reproducing apparatus 200, and the like on a screen of the GUI unit 100, but also outputs the image pickup data or

the reproduced image data, the operating status of the image pickup recording and reproducing apparatus 200, and the like to an external output terminal on the basis of a predetermined output format.

5   In the present embodiment, while the memory 108 is used for the compression and expansion processing in recording and reproducing the data, part of the memory 108 is also used for both the later-mentioned prereproduction processing and the shock-proof memory

10   function for recording and reproducing processing, which is provided to the disk 206 by the recording and reproducing processing unit 205.
The overall configuration and a series of operations of the recording medium 206 and the medium control

15   unit 207

        Fig. 2 shows a configuration of the disk 206 and the medium control unit 207. A magneto-optical disk is used for such the disk 206 as DVD in the present embodiment.

20   The medium control unit 207 functions as s disk drive. As shown in Fig. 2, the medium control unit 207 includes a spindle motor 301, a spindle motor driver 302, an optical pickup 303, a traverse motor 304, a traverse motor driver 305, a magnetic head 306,

25   a laser driver 307, a preamplifier 308, a servo DSP (Digital Signal Processor) 309, and a magnetic head driver 310.

In the medium control unit 207, while the servo
DSP 309 performs predetermined servo-rotation on the
disk 206 by controlling the spindle motor 301 through
the spindle motor driver 302, the servo DSP 309

5 causes the optical pickup 303 to trace a
predetermined track of the disk 206 by driving and
controlling the traverse motor 303 through the
traverse motor driver 305. The servo DSP 309 also
performs focus control and tracking control by

10 controlling an actuator of the optical pickup 303.

In the operation of reproducing the data from
the disk 206, the laser driver 307 irradiates the
disk 206 with a laser beam having predetermined
reproducing power, detects reflected light quantity

15 difference from the disk 206, and performs
optoelectric conversion of the reflected light to
obtain a reproduced electric signal corresponding to
reflected light and output the reproduced electric
signal to the preamplifier 308.

20 The preamplifier 308 amplifies the input
reproduced electric signal to a predetermined signal
level, performs matrix processing and the like on the
amplified signal, and outputs the signal. The signal
output from the preamplifier 308 is supplied to the

25 recording and reproducing processing unit 205 shown
in Fig. 1, and the recording and reproducing
processing unit 205 performs the above-mentioned

processing on the signal.

In the operation of recording the data on the disk 206, the laser driver 307 pulse-modulates predetermined recording power to irradiate the disk 206. At the same time, the magnetic head driver 310 applies a recording modulation magnetic field to the disk 206 with the magnetic head 306 and records magnetic information on the disk 206, on the basis of the data (recording modulation signal) which has been processed by the recording and reproducing processing unit 205 shown in Fig. 1.
Reproducing operation in the image pickup recording and reproducing apparatus 200

Fig. 3 is a functional block diagram showing a prereproduction processing function in the image pickup recording and reproducing apparatus 200.

As shown in Fig. 3, the image pickup recording and reproducing apparatus 200 includes the GUI unit 100, the menu generation unit 104, the prereproduction processing unit 105, the memory control unit 106, the system control unit 107, the memory 108, and video output processing unit 109, which have been already shown in Fig. 1. The GUI unit 100 includes a display unit 101, selection unit 102, and decision unit 103.

The image pickup recording and reproducing apparatus 200 is equipped with a microcomputer (not

shown) mainly including CPU, ROM, and RAM. The
microcomputer realizes all the functions or a part of
the functions of the above GUI unit 100, menu
generation unit 104, prereproduction processing unit

5   105, memory control unit 106, system control unit 107,
video output processing unit 109, camera signal
processing unit 203, compression and expansion
processing unit 204, recording and reproducing
processing unit 205, and medium control unit 207.

10   The system control unit 107 can previously
reproduce disk management information including
information such as a recording address of each clip
recorded in the disk 206 and a file name of the clip
contained in each group settable in initial setting

15   shown in Fig. 6, during mounting the disk 206 or
power-up and store the disk management information in
the predetermined area of the memory 108, and the
system control unit 107 can confirm and reproduce the
recording address of the front-end image data of each

20   group on the basis of the disk management information
in the prereproduction processing.

        Fig. 4 is a timing chart showing the operation
of the prereproduction processing unit 105 shown in
Fig. 3. In Fig. 4, a reference numeral 51 denotes

25   time-progression of the data amount in the memory 108,
a reference numeral 52 denotes a selection signal
obtained from the selection unit 102 in the GUI unit

100, a reference numeral 53 denotes a decision signal obtained from decision unit 103 in the GUI unit 100, a reference numeral 54 denotes a data write control signal supplied to the memory control unit 106, and a

5   reference numeral 55 denotes a data read control signal supplied to the memory control unit 106.

When the prereproduction processing unit 105 receives the selection signal 52 from the GUI unit 100 at the time t0, the prereproduction processing

10   unit 105 gives a reproduction start instruction to the system control unit 107. The system control unit 107 starts data reproducing operation toward a designated address, terminates physical access to the predetermined address at time t1, and sequentially

15   reproduces the data.

A timing of writing into the memory 108 during the reproduction is in the range from the time t1 to the time t2 as shown in the data write control signal 54, and the reproduction data corresponding to the

20   predetermined amount "a" is accumulated in the memory 108. The system control unit 107 monitors the memory amount in the memory 108. When the memory amount reaches the predetermined amount "a", the system control unit 107 terminates the data writing into the

25   memory 108 and becomes in a standby status.

The predetermined amount "a" indicates the memory amount in the area where the memory can be

utilized as buffer memory for prereproduction

(hereinafter referred to as prereproduction area)

among the whole memory capacity of the memory 108.

When the prereproduction processing unit 105

5   receives the decision signal 53 from the GUI unit 100

at the time t3, the prereproduction processing unit

105 instructs the system control unit 107 to read out

the designated information from the memory 108. Then,

the system control unit 107 instructs the memory

10   control unit 106 to perform data readout from the

memory 108, and the memory control unit 106 reads out

the reproduced data from the memory 108 according to

the memory read control signal 55. Then, the system

control unit 107 reproduces and outputs the

15   reproduced data according to the memory write control

signal 54 and the memory read control signal 55,

while buffering the reproduced data in the memory 108.

Fig. 5 is a flow chart showing the

prereproduction processing according to the first

20   embodiment.

STEP S1001: Setting the initial value in the menu

generation unit 104

In the present embodiment, when image contents

recorded in the disk 206 are reproduced, thumbnail

25   images of the contents recorded in the form of a menu

are displayed in list form by operating the GUI unit

100. The reproduction of the image data is started

by the reproduction start instruction after selecting
the thumbnail of the desired contents among the
thumbnail images displayed in list form.

At this point, the user can arbitrarily set the
5   kinds of contents displayed as a menu screen.

Fig. 6 shows a GUI screen for setting the
initial values of the kinds of contents displayed on
the menu screen.

In the GUI screen shown in Fig. 6, one of MOVIE,
10   STILL, and MOVIE and STILL can be initially set for
an item of the contents displayed on the reproduction
menu screen. A date, a recording rate, an event,
user definition, and the like can be initially set
for a group of the displayed contents.

15   At this point, the recording rate means a
compression rate with which the user records the
picked-up image. For example, when a coding
algorithm such as MPEG is used, the compression rate
means distinction among HD (not lower than 18 Mbps),
20   fine (equivalent to 14 Mbps), standard (equivalent to
9 Mbps), and the like. The event means group
classification of each event on the basis of a
keyword such as "a sports festival", "travel", and "a
recital" for a photographing record.
25   STEP S1002: Reproduction start point selection menu
display

The GUI menu for selecting a reproduction start

point (contents) is displayed on the display unit 101
of the GUI unit 100.

Fig. 7 shows an example of a hierarchy of the
reproduction menu when the initial setting of the

5   display item is a still image. The menu screen of
the item still image is displayed as MENU 1 in Fig. 7.
The menu screen can be transferred between hierarchal
menus such as MENU 2 and MENU 3 by operating the
selection unit 102 of the GUI unit 100. The menu

10 screen in which the initial setting of the group is
DATE is displayed in MENU 2 of Fig. 7, and in MENU 3
which is the lower hierarchy of a specified date and
time (DATE 1), the menu screen of still image files
(PHOTO 1, PHOTO 2, ...) taken at that specific date

15 and time is displayed.

Fig. 8 shows an example of a hierarchy of the
reproduction menu when the initial setting of the
display item is a moving image. The menu screen of
the item moving image is displayed as MENU 1 in Fig.

20 8. The menu screen can be transferred between
hierarchal menu such as the MENU 2 and MENU 3 by
operating the selection unit 102 of the GUI unit 100.
The menu screen in which the initial setting of the
group is DATE is displayed in MEMU 2, and in the

25 lower hierarchy of a specified date and time (DATE 1),
the menu screen of moving image clips (CLIP 1, CLIP
2, ...) taken at that specific date and time is

displayed.

The clip is a series of sets of the images, which has the meaning as the moving image, and the data showing a series of moving images from a recording start to a recording end is recorded as one clip in the present embodiment.

The menu screen can be displayed by unit of time as the further lower hierarchy in MENU 4, and each unit of the image frame can be displayed in MENU 5.

When the GUI unit 100 directs the system control unit 107 to display the menu screen, the system control unit 107 controls the recording and reproducing processing unit 205 and the medium control unit 207 on the basis of the management information, reads out the thumbnail image data of each content displayed on the menu screen from the disk 206 in order, and accumulates the data in the memory 108. After the thumbnail image data accumulated in the memory 108 is expanded by the compression and expansion processing unit 204, the expanded thumbnail image data is transmitted to the GUI unit 100. The menu generation unit 104 generates the menu screen by using the thumbnail image data.

STEPs S1003 and S1004: From reproduction start point to prereproduction processing

The reproduction start point is selected from

the menu screen generated by the menu generation unit 104.

Referring to Fig. 9, a method of selecting the reproduction start point will be described.

5   A reference numeral 91 shown in Fig. 9 denotes the menu screen of MENU 2 in the GUI unit 100. The predetermined thumbnail images representing each group by unit of the date and time are displayed in the screen 91 of MENU 2. The user can select the

10   thumbnail image of arbitrary group by moving a cursor 91a with the GUI unit 100.

For example, when the user selects the thumbnail of DATE 8 as the reproduction start point as shown in Fig. 9, the selection unit 102 outputs

15   the selection signal, the prereproduction processing unit 105 instructs the system control unit 107 to perform the prereproduction processing. As shown in a reference numeral 92 shown in Fig. 9, the system control unit 107 reproduces the data from the front

20   end (time t0) of the image data in the group of DATE 8 in order of time series by controlling the recording and reproducing processing unit 205 and the medium control unit 207, and write the data in the memory 108.

25   During displaying the screen of MENU 2, MENU 2 can be transferred to a screen 93 of MENU 3 of the further lower hierarchy. The thumbnail images of all

the clips included in the group of DATE 8 can be also displayed on the display screen of MENU 3 to select the thumbnail of the desired clip from the list of the thumbnail images.

5   For the prereproduction processing in STEP S1004, for example, only the predetermined data amount "a" is written in the prereproduction area of the memory 108 by reading out the image data included in the group of DATE 8 recorded in the disk 206 in

10   order from the front end of the image data.

The processing of selecting the reproduction start point in STEP S1003 is one, in which the cursor is moved by the selection unit 102 to select one of the currently displayed thumbnail images. Therefore,

15   when update of the menu hierarchy is instructed by the selection unit 102, the prereproduction processing returns to STEP S1002 and the updated menu is displayed in list form.

STEPs S1005 and S1006: Data readout by decision

20   (determination) of reproduction start point

When the reproduction start point is decided (determined) by the decision unit 103 of the GUI unit 100, the reproduced data from the reproduction start point which is accumulated in the prereproduction

25   area of the memory 108 is read out in order.

At this point, the user decides the reproduction start by operating a reproduction start

key or the like after the user selects the thumbnail image by moving the cursor on the menu screen. The decision unit 103 detects the operation of the reproduction start key or the like and instructs the

5   reproduction start.

As shown in Fig. 4, after starting the reproduction, the data is read out from the prereproduction area of the memory 108 and expanded by the compression and expansion processing unit 204,

10   and the subsequent reproduced data is newly written and replenished at the time when the amount of reproduced data stored in the memory 108 is decreased to b.

STEP S1007: Video display and external output

15   The video output processing unit 109 not only displays the expanded image data, the operating status of the image pickup recording and reproducing apparatus 200, and the like on the screen of the GUI unit 100, but also outputs the expanded image data,

20   the operating status of the image pickup recording and reproducing apparatus 200, and the like to the external output terminal on the basis of the predetermined output format.

As described above, in the first embodiment,

25   the menu screen showing the list of the thumbnail images such as the groups and the clips, which indicate the position capable of starting the

reproduction, is displayed on the screen of the GUI

unit 100. When one of the thumbnail images displayed

on the menu screen is selected, the prereproduction

processing, in which the front-end part of the image

5 data concerning the selected thumbnail image is

immediately read out from the disk 206 and stored in

the memory 108 before the prereproduction start

instruction of the selected image data is provided,

is performed.

10   Accordingly, the prereproduction can be started

rapidly and correctly from the desired position in

the moving image data recorded on the disk 206. In

this case, it is not necessary to prepare the large-

capacity memory as the memory 108, namely the buffer

15 memory for the prereproduction.

     In other words, the desired data recorded on

the disk-shaped recording medium can be rapidly and

correctly reproduced and output by using the small-

capacity memory.

20 Second Embodiment

     In the first embodiment, the selected image

data is pre-reproduced at the time when one of the

plurality of thumbnail images displayed on the menu

display screen is selected. However, in a second

25 embodiment, the image data concerning the whole

thumbnail images displayed on the menu screen is pre-

reproduced at the time when the menu screen is

displayed.

The prereproduction processing in the second embodiment will be described below referring to the flow chart shown in Fig. 10.

5   STEP S1401: Setting initial value in menu generation unit 104

STEPs S1402 and S1403: From prereproduction processing to reproduction start point selection menu display

10   An example of the operation of the prereproduction processing unit 105 of the embodiment will be described referring to Fig. 11.

A reference numeral 131 shown in Fig. 11 denotes the display screen of MENU 3. The thumbnail

15   images of the picture clips included in the group of a date (DATE 8) are displayed in list form in the screen 131 of MENU 131. A reference numeral 132 denotes the states of the target data of the prereproduction processing in order of time series

20   when the menu screen 131 is displayed.

Each data at the time t0, t1, ..., t5 shown in 132 of Fig. 11 is the video data of the front end of each clip displayed on the menu screen 131. In this case, each image data of δt minute is pre-reproduced

25   from the front end of each clip (from CLIP 1 to CLIP 6) displayed on the display unit 101 of the GUI unit 100.

The above-mentioned prereproduction processing is executed in the present embodiment, when a change signal (hierarchy selection signal) of the menu hierarchy is output by the operation of the selection

5 unit 102 or when the menu of an uppermost layer is displayed after the reproduction menu initial setting.

Fig. 12 shows transition of the data stored in the prereproduction area of the memory 108 in the second embodiment. In Fig. 12, a reference numeral

10 121 denotes time transition of the data amount in the memory 108, a reference numeral 122 denotes a selection signal obtained from the selection unit 102 of the GUI unit 100, a reference numeral 123 denotes a decision signal obtained from the decision unit 103

15 of the GUI unit 100, a reference numeral 124 denotes a data write control signal supplied to the memory control unit 106, and a reference numeral 125 denotes a data read control signal supplied to the memory control unit 106.

20 At the time to, when the change signal (hierarchy selection signal) 122 of the menu hierarchy is output by the operation of the selection unit 102 or when the selection signal 122 of the menu hierarchy of the uppermost layer is output after

25 entering the reproducing mode, the prereproduction processing unit 105 provides the instruction so as to reproduce the image data concerning the whole

thumbnail images displayed on the menu screen of the display unit 101 by δt minute from each front end. The system control unit 107 controls the recording and reproducing processing unit 205 and the medium
5   control unit 207 to reproduce sequentially the front-end part of each image data from the time t0 to the time t2 and writes the front-end part of each image data in the memory 108.

In this case, as denoted by the reference
10   numeral 124, the write control signal to the prereproduction area of the memory 108 is repeatedly output for the image data concerning the whole thumbnail images displayed on the menu screen, and each target data is sequentially reproduced by the
15   data amount "c" from the front end in a time period from the time t1 to the time t2 and each target data having the data amount "c" is accumulated in the memory 108.

The system control unit 107 is switched to a
20   standby state after completing the accumulation of the whole prereproduction data into the memory 108.

The setting time δt is determined by the number of thumbnail images displayed on the menu screen (reproduction start contents) and the amount "a" of
25   target buffering memory stored in the prereproduction area of the memory 108, and the pre-reproduced data amount "c" of each image data is expressed as

follows:

Prereproduction data amount "c" of each image data = Target buffer amount "a"/Number of menu screen display clips (Number of selectable target data)

5   STEPs S1404 to S1406: Reproduction of image data by selection and decision of reproduction start point

When the desired thumbnail image (reproduction start point) is selected by the selection unit 102 of the GUI unit 100 and the reproduction start point is

10   decided by the decision unit 103, the image data corresponding to the selected thumbnail image (contents) among the image data accumulated in the prereproduction area of the memory 108 is sequentially read out from the front end to be output

15   to the compression and expansion processing unit 204.

The transition of the prereproduction area of the memory 108 in this case will be described referring to Fig. 12 again.

In Fig. 12, when the prereproduction processing

20   unit 105 receives the selection signal 122 from the GUI unit 100 at the time t3 and receives the decision signal 123 at the time t4, the prereproduction processing unit 105 instructs the system control unit 107 to read out the image data from the designated

25   reproduction start point (contents) among the image data accumulated in the prereproduction area of the memory 108. The system control unit 107 instructs

the memory control unit 106 to read out the image

data from the reproduction start point from the

prereproduction area of the memory 108. The memory

control unit 106 reads out the image data from the

5   reproduction start point from the prereproduction

area of the memory 108 on the basis of the memory

read control signal 125, and outputs the image data

to the compression and expansion processing unit 204.

In this case, the image data after the

10   reproduction start point is the image data of the

contents corresponding to the thumbnail image

selected by the selection unit 102, and the image

data of other contents accumulated in the

prereproduction area of the memory 108 is not read

15   out.

Then, as shown in the memory write signal 124

and the memory read signal 125, the system control

unit 107 reproduces the image data after the front-

end part stored in the prereproduction area of the

20   memory 108 from the disk 206 at the time when the

reproduction start point is decided, and outputs the

image data to the compression and expansion

processing unit 204 while accumulating the image data

in the memory 108.

25   STEP S1407: Video display and external output

While the video output processing unit 109

displays the image data reproduced in the above-

mentioned way on the display unit 101 of the GUI unit 100, the video output processing unit 109 outputs the external output terminal on the basis of the predetermined output format.

5   As described above, in the second embodiment, the data of the front-end part of the whole contents concerning each thumbnail images displayed on the menu screen is pre-reproduced and stored in the memory 108 at the time when the menu screen is

10 displayed, so that the same effect as the first embodiment can be obtained and the desired data can be reproduced more rapidly than the first embodiment.
Third Embodiment

In a third embodiment, the front-end part of

15 the image data of the clip having the highest priority is pre-reproduced according to the predetermined reproducing condition, when the reproduction is decided under the predetermined condition.

20 The prereproduction processing in the third embodiment will be described below referring to a flow chart shown in Fig. 13.
STEP S1501: Executing prereproduction processing

For example, in the case the reproducing mode

25 is set by a mechanical reproducing button (not shown) while the disk 206 in which overwrite disabling processing has been done is mounted on the image

pickup recording and reproducing apparatus 200, the prereproduction processing unit 105 instructs the system control unit 107 to pre-reproduce the data of the clip having the highest priority in the clips

5   recorded in the disk 206 by the predetermined amount from the front end, e.g. the data amount "a" shown in Figs. 4 and 12 according to the predetermined reproducing condition.

The reproducing condition which generates the

10   data in order from the oldest updated date is set in the present embodiment, and the front end part of the picture clip having the oldest date in the picture clips recorded in the disk 206 is pre-reproduced.

When the system control unit 107 receives the

15   prereproduction instruction, the system control unit 107 controls the recording and reproducing processing unit 205 and the medium control unit 207 based on the management information of the disk-shaped recording medium 206 to reproduce the data of the clip having

20   the oldest date by the data amount "a" from the front end, and accumulates the data in the prereproduction area of the memory 108.

STEPs S1502 to S1504: Reproduction output

When the decision unit 103 of the GUI unit 100

25   decides the reproduction start in the above state, the data of the front-end clip accumulated in the prereproduction area of the memory 108 by the

prereproduction processing in STEP S1501 is read out
to output the data to the compression and expansion
processing unit 204.

After reproducing and outputting the data of
5   the front-end part accumulated in the prereproduction
area of the memory 108 by the predetermined amount,
the system control unit 107 controls the recording
and reproducing processing unit 205 to perform the
reproduction while reproducing sequentially the
10   remaining of the image data of the front-end clip to
accumulate the data in the memory 108. When the
reproduction of the front-end clip is completed, the
reproduction is performed while reproducing
sequentially the data of the clip having the second
15   oldest update date and the data of the clip having
the third oldest update date to accumulate the data
in the memory 108.
STEPs S1505 to S1510: From reproduction start point
selection to prereproduction processing
20   When the instruction of the reproduction start
is absent and the instruction of the menu screen
display is present in STEP S1502, the menu screen is
displayed in the same way as the first embodiment,
the image data selected from among the thumbnail
25   images displayed on the menu screen is pre-reproduced,
and the reproduced data is output in response to the
decision (determination) operation.

Since the processing from STEP S1505 to STEP S1510 is completely the same as the processing from STEP S1002 to S1007 in the first embodiment shown in Fig. 5, the detail description will be omitted.

5   However, when the prereproduction processing is performed in STEP S1507, the data of the contents with respect to the selection is pre-reproduced by erasing or overwriting the data stored in the prereproduction area of the memory 108 through the

10   prereproduction processing in STEP S1501.

As described above, in the third embodiment, the data of the front-end part of the front-end clip having the highest priority depending on the predetermined reproducing condition is pre-reproduced

15   according to the setting of the reproducing mode, so that the reproduction of the image of the front-end clip can be rapidly started even if the reproduction instruction is provided without displaying the menu screen.

20   In the embodiment, the user can arbitrarily set the reproducing condition by operating the GUI unit 100. For example, the clip having the oldest date was set to the front-end clip in the above description. However, instead of the above

25   description, the clip having the latest recording date can be also set to the front-end clip and its front-end part can be pre-reproduced.

When the user changes the reproducing condition, the system control unit 107 detects the changed reproducing condition, e.g. the clip having the latest recording date on the basis of the management

5   information of the disk 206, reproduces the image data by the predetermined data amount from the front-end part of the front-end clip, and accumulates the data in the memory 108.

The invention is not limited to the above-
10   described embodiment. For example, similarly to the second embodiment, the front-end part of the predetermined number of contents among the contents displayed on the menu screen may be pre-reproduced without reproducing the data of the front-end part of
15   the whole contents displayed on the menu screen.

The above embodiments are in consideration of the data which has a meaning when it is time-series recorded and reproducted, i.e. the case in which particularly the moving image data is recorded and
20   reproduced. However, the embodiments is also applicable to the data except the moving image data, which also has a meaning what it is time-series recorded and reproducted, such as music data.

The objects of the invention can be achieved in
25   such a manner that the storage medium storing program code of software realizing the functions of the host and the terminals of the first embodiment to the

third embodiment is supplied to the system or the apparatus and the computer (or CPU or MPU) of the system or the apparatus reads out and executes the program code stored in the storage medium.

5   In this case, the program code itself read out from the storage medium realizes the functions of the first embodiment to the third embodiment, and the program code and the storage medium storing the program code constitute the invention.

10   ROM, a flexible disk, a hard disk, an optical disk, the magneto-optical disk, CD-ROM, CD-R, magnetic tape, non-volatile memory card, and the like can be used as the storage medium for supplying the program code.

15   The functions of the first embodiment to the third embodiment are realized by executing the program code read out with the computer. Further, the invention includes the case in which an operating system and the like running on the computer perform a

20   part or the whole of the actual processing on the basis of the direction of the program code and the functions of the first embodiment to the third embodiment are realized by the processing of the operating system and the like.

25   Further, the invention also includes the case in which, after the program code read out from the recording medium is written in the memory included in

an extended function board inserted in the computer or
an extended function unit connected to the computer,
CPU or the like included in the extended function board
or the extended function unit performs a part of or the
5   whole of actual processing on the basis of the
direction of the program code and the functions of the
first embodiment to third embodiment are realized by
the processing.

Fig. 14 shows function 1600 of the above-
10   mentioned computer.

As shown in Fig. 14, the computer function 1600
has the configuration in which CPU 1601, ROM 1602,
RAM 1603, a keyboard controller (KBC) 1605 of a
keyboard (KB) 1609, a CRT controller (CRTC) 1606 of a
15   CRT display (CRT) 1610 as the display unit, a disk
controller (DKC) 1607 of a hard disk (HD) 1611 and a
flexible disk (FD) 1612, and a network interface
controller (NIC) 1608 for connection to a network
1620 are communicatably connected to one another
20   through a system bus 1604.

CPU 1601 controls each component unit connected
to the system bus 1604 by executing the software
stored in ROM 1602 or HD 1611 or the software
supplied from the flexible disk 1612. That is to say,
25   CPU 1601 performs the control for realizing the
operations in the first embodiment to the third
embodiment by reading out a processing program

obeying a predetermined processing sequence from ROM
1602, HD 1611, or FD 1612 and executing the
processing program.

RAM 1603 functions as a main memory or a work
5   area of CPU 1601. KBC 1605 controls an instruction
input from KB 1609, a pointing device (not shown), or
the like. CRTC 1606 controls the display of CRT 1610.
DKC 1607 controls access to HD 1611 and FD 1612 which
store a boot program, various applications, an edit
10   file, a user file, a network management program, the
predetermined processing programs in the first
embodiment to the third embodiment, and the like.
NIC 1608 bi-directionally exchanges the data with the
apparatus or the system on the network 1620.

15   When the operations in the first embodiment to
the third embodiment are realized, as mentioned above,
the selection unit 102 and the decision unit 103 in
the GUI unit 100 can realize the function by the
direction input from a mouse cursor (not shown), the
20   pointing device, or the like.

Further, it is obvious that a plurality of data
reproducing processing processes are possessed and
the operations in the first embodiment to the third
embodiment can be realized by pipeline processing.

25   Many widely different embodiments of the
present invention may be constructed without
departing from the spirit and scope of the present

invention. It should be understood that the present
invention is not limited to the specific embodiments
described in the specification, except as defined in
the appended claims.

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